Flight Simulator Input/output Devices

EPIC

R&R Electronics developed EPIC (Extended Programmable Input/output Controller) ([R&R Electronics](http://www.mindspring.com/~rrelect/)), but actively marketed by [Flight Link](http://www.flightlink.com/epic/index.html) and [Micro Cockpit](http://www.microcockpit.com). The board uses rather low level technology compared to other more modern options currently available. It was there first and knows a relative large group of dedicated and enthusiastic (first hour) users.

There are 2 versions of the EPIC board, the ISA version (not longer sold) and the newer USB version. There is 1 main EPIC board that supports a "data bus". To this bus multiple modules can be connected that serve various purposes: connecting switches, control digital displays, connect rotary encoders, interface to analogue signals, etc. This architecture allows the construction of both relative simple and very complex flight simulator cockpits. The EPIC board comes with a programming environment for controlling all the devices and generating input for the PC. Making use of Microsoft Flight Simulator data within the EPIC board requires more effort, using a technique called "Pigeon Holes". For interfacing with Microsoft Flight Simulator several software utilities have been developed. Probably the best known is EpicInfo ([Peter Dowson](http://www.schiratti.com/dowson.html)). Based on FSUIPC this utility gives the EPIC board the power to closely integrate with Microsoft Flight Simulator.

The EPIC board has a learning curve, but after that the options are almost only limited by your imagination. Background information on the use of EPIC can be found at the [Blue Side Up](http://avsim.com/bluesideup/) site, but there are also several sites of flight simulator cockpit builders that give specific information on this issue, such as [JAM's Flight Sim World](http://members.cox.net/martin1jam/Files/USB_EPIC_ManV5.0.pdf). On [AVSIM](http://www.avsim.com/) there is a forum related to the use of EPIC.

FSBUS

A very important initiative introduced by Dirk Anderseck is FSBUS ([FSBus](http://www.fsbus.de/" \t "_blank)). By now FBUS is adopted by a large number of flight simulator cockpit builders. FBUS is a kit-based approach. Using a micro controller and some special purpose ICs one can built an interface device for the Microsoft Flight Simulator. With the help of detailed documentation you have to do it yourself or can buy kits. Software and the wiring layouts of the various components you need can be downloaded for free! Additionally you will have to buy the parts and construct the components. Examples can be found in the English section on [Finnish FSBUS Fanatics](http://mikkila.wabbits.org/fsbus/index_e.php).

InterfaceIT

InterfaceIT ([Flightdeck Solutions](http://www.flightdecksolutions.com/" \t "_blank)) has the objective to enable flight deck builders to quickly integrate their switches and display/LED's to Microsoft Flight Simulator (and other flight simulators). InterfaceIT is a USB based system starting with a main controller between the Flightdeck Solutions software and the inputs/outputs in the flight simulator cockpit. The main controller comes with 70 configurable inputs. Additionally there are add-ons like: Connection Panel to enable easy connection of switches, The Rotary Decoder board to enable conversion of rotary encoders output, The Display Driver board to enable output to 64 7-Segment displays, 512 individual LED's or any combination.

IOCards

A group of Spanish cockpit builders founded [Open Cockpits](http://www.opencockpits.com/) offering IOCards. This is a large and active community of cockpit builders, introducing new devices and software on a regular basis. All the circuit diagrams (printed circuits included) can be downloaded from this site in order to build the hardware your self. It is also possible to order kits or a ready made / tested cards. The related software (including development DLLs) can downloaded for free.

The IOCard system follows a structure with a master card that interfaces with the computer by means of a parallel or USB port. Additionally, this card has 72 digital inputs and 64 digital outputs. The master card can connect several cards with a specific purpose, such as: controlling LED displays, controlling relays, A/D converter, encoder circuit, servo motor circuit, stepper motor circuit. In total 4 master cards can be connected to 1 computer. The system can also be used in a network setting.

For driving the IOCards in a more advanced setting the software package [IOCPServer](http://www.iocpserver.com/) can be used. It combines the functionality of FSUIPC and WideFS. Also a SDK is available for direct control of the cards.

MJoy

The MJoy16-C1 ([Mindaugas](http://www.flightsimproducts.com/" \t "_blank)) is a multifunction plug-and-play USB joystick controller. It is installed by Windows automatically and can be used right away. Supported are 8 analogue axes inputs, 64 pushbuttons, 16 toggle switches,  4 rotary switches and 1 8-way hat switch. A Key Matrix board is available to simplify the wiring. A point of attention is that currently many Windows applications have a limitation of 32 buttons per joystick device (including Microsoft Flight Simulator 2004). However, a software based work-around is offered called MJoy Mapper.

MPC737

[CPFlight](http://www.cpflight.com/) is offering the MCP737. The MCP737 is actually a Boeing 737 MCP interfacing with the Microsoft Flight Simulator. However additionally the MCP737 forms the center of an easily expandable system with capability to drive digital and analog I/O.  The MCP73 can be daisy-chained with additional interface boards. Software is provided to easily install / configurate the interface boards. MCP737 is connected to the PC through the serial port (RS232). The DIN 5pole socket allows for daisy-chaining up to 255 modules. No technical background knowledge is required. The modules can be full blown components as EFIS selector, Radio, Transponder, Navigation, but also an expansion board (64 digital inputs, 10 digital outputs, 6 analog inputs, 2 analog outputs). Besides digital and analog I/O assignment, the supporting software allows for testing connected devices and calibration of potentiometers.

PHCC

An open source hardware and software initiative under the GNU Public License (GPL) is [PHCC](http://cockpit.varxec.net/electronics/PHCC.html). DIY low price modular interface system consisting of a motherboard and a series of daughter boards for switch controllers, display controllers, stepper controllers, digital out, servos. The board uses a RS-232 interface, a USB daughter board available. By means of a I2C protocol devices can be connected that are not supported / supplied by the PHCC system. Characteristics: up to 1024 switches/push buttons, 35 channels analog in, unlimited 8bit digital for 7 segment displays, stepper control via H-bridge drivers, character LCD Displays, Relays/solenoids, lamps/Korry switches and indicators, servos, analog out.

Board assembly tutorials are provided. There is also a [forum](http://forums.varxec.net/).

Phidgets

"Physical widgets or Phidgets are to physical user interfaces what widgets are to graphical user interfaces. Similar to Widgets, Phidgets abstract and package input and output devices: they hide implementation and construction details ...". Phidgets ([Phidgets](http://www.phidgets.com/" \t "_blank)) offers a range of interface cards and forms  a radical new approach. All cards are based on USB communication with the PC. Multiple cards in any combination can be connected. The claim is that everyday programmers using Phidgets can rapidly develop physical interfaces. No knowledge of hardware, microprocessors, USB and communication protocols is needed. Detailed examples in Visual Basic are provided (also examples for C, Java and Delphi are available). Examples of interface cards are: control of one or more servo motors, a wide variety of LED products (numeric displays, alphanumeric modules, discrete LEDs), LCD screens, control of a DC power supply, digital input, analog input, digital output and a series of sensors.

Phidgets provides a very modular interface structure for cockpit development. Examples can be found on the sites: [Chris Brace](http://121.72.68.196/simulator/simulator.php), [F15C Eagle](http://www.f15sim.com/phidgets/phidgets.html). There special interface software called [FS2Phidget](http://mycockpit.org/forums/forumdisplay.php?f=123) (freeware) developed by Alan Dyer. Using FS2Phidget one does not need to know how to program nor in detail understand the interfaces. After installing FS2Phidget and setting up the Phidgets to the computer one only needs to configure how the cockpit instruments (Phidgets) interface with MSFS.

Remote Mount Kit

In addition to the standard flight simulator cockpit components [GoFlight](http://www.goflightinc.com/) is offering an interface board called Remote Mount Kit. The interesting point is that no specific software development is needed. The RMK's are connected to the Microsoft Flight Simulator by the same configuration software as is used for the normal GoFlight cockpit components. To facilitate the development of panels GoFlight offers in addition a selection of switches, potentiometers, LEDs and displays that are compatible with the RMK modules, but you can use also your own parts.

SIM-board

[Flightdeck Technology](http://www.flightdecktechnology.com/) is a UK-based company producing SIM-board. This is a range of specialized input/output control hardware modules. There is support for: switches, pushbuttons and other input switch devices, rotary and linear potentiometer devices, rotary encoder devices, control of LEDs, lamps, and other basic output devices, a 256 LED module and 7-segment display. The control software is supplied free and allows an easy assignment of actions to the board via a point-and-click user interface (support for both Microsoft Flight Simulator and add-ons like Project Magenta). Advanced users can create more complicated assignments using the Visual Basic-style SIM-board Scripting Language. The claim is that no expertise or knowledge of electronics or computer programming is required to use the SIM-board range.

SimKits

On the site of [SimKits](http://www.simkits.com/) a trail-blazing concept is offered. They sell ready kits for a large set of mechanical gauges, but you can also chose to buy only specific parts and construct your own gauges. In order to drive the instruments they provide or the instruments you make yourself they provide a series of interface boards CCU, Multi Controller, 32-Digital Input USB controller and 6-Analog Input USB controller. The 2 USB controllers are recognized as standard input devices and can be used within the Microsoft Flight Simulator without any special software. For the CCU and Multi Controller SimKits offers supporting software which interfaces the boards with the Microsoft Flight Simulator. For custom made gauges and for those who want to control the instruments directly a SDK is provided to enable to drive the SimKits instruments from your own software. Basically, with the use of the SDK, there is no limit to use the SimKits instruments from any type of software written by yourself.

Sim-Modules

Sim-Modules is a very interesting initiative of 2 students [Christopher Hauser & Rene Muller](http://www.sim-modules.at/). It is a modular, all plug-and-play system to simulate all kind of avionics for home flight simulation. It is based on latest micro-controller technology (AVR-8Bit RISC-family by ATMEL). The system consists of one master module, which is connected to the PC via the serial port (RS232) and the different avionic modules (slaves). The master-module is the link between the software running on the PC and the avionic-modules. The avionic modules are connected to the master module using a data bus so they can be daisy-chained.

TCP-USB-S1

The TCP-USB-S1 ([ITRA](http://www.itra.de/)) is a programmable USB-Controller that works with a keyboard manager in Windows2000/XP systems as keyboard controller with up to 256 keys in a matrix of 16 rows and 16 columns. For every key are 255 virtual key codes programmable, a pause between key codes is possible and also a repeat rate. Additionally there are boards for the connection of switches (TCP-USB-EW2), the connection of rotary encoders (TCP-USB-DREH4) and the connection of keys (TCP- USB-V2). All together one can define a whole architecture of boards to facilitate the handling of switches in the flight simulator cockpit.

Velleman K8000

On the site from [Johan Nauwelaertz](http://members.tripod.com/fcsimulator/) the development of a flight simulator cockpit is documented using the K8000 interface card ([Velleman](http://www.velleman.be/" \t "_blank)). You can download FSUIPC based interfacing software for the Microsoft Flight Simulator. The card is connected to the PC via the printer port (allowing the use of printer on the same port). The connection to the computer is optically isolated. The card comes with standard support for interfacing using Turbo Pascal, Qbasic, Visual Basic or C++. The K8000 has 16 optically isolated digital connections (I/O), 9 analogue outputs and 4 analogue inputs. Up to 4 cards can be connected together (1 master and 3 slaves). The K8000 comes as a kit.

Other options

There are other more "game oriented" options available, but most do not go beyond an advanced "game card". An interesting site to start is [Arcade Controls](http://www.arcadecontrols.com/). Although an increasing number of ready made flight simulator cockpit devices come these days with a USB interface, the "traditional" game port may prove useful for those who want to built there own throttle quadrant. On the standard game port there are four analog pins that can be connected to a potentiometer. In general a PC has a standard game port and/or has a game port included in the sound card (where this port is also used to connect musical instruments such as keyboards, electric guitars, etc.). A PC can support multiple game ports.